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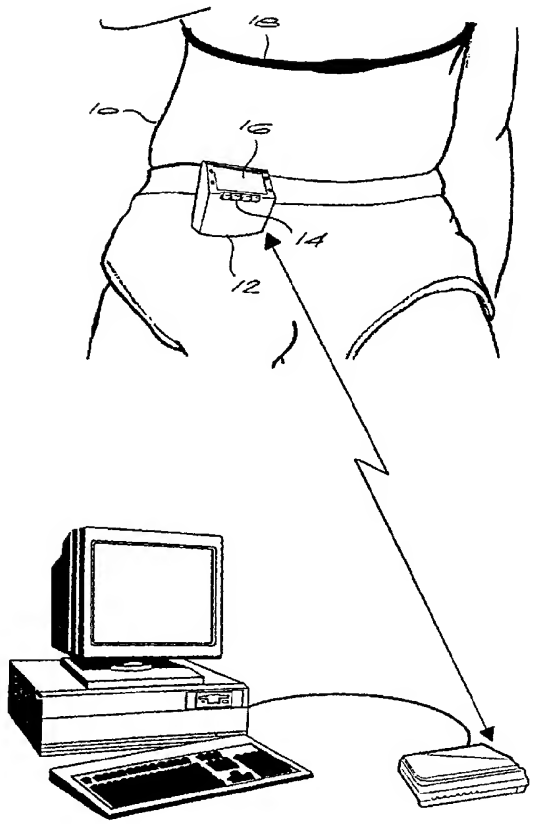
(54) Title: METHOD AND APPARATUS FOR MONITORING EXERCISE



(57) Abstract: A method and apparatus for monitoring exercise are disclosed. A user participating in a virtual exercise class utilises apparatus which comprises at least one sensor for monitoring a selected exercise parameter such as heart rate. The apparatus indicates a processor for generating performance data from the sensor output and an interface for transmitting performance data to a remote site. Typically, the apparatus is portable and communicates wirelessly with a PC of the user, to transmit the performance data to remote site via the Internet or another network. At the remote site, response data is generated based on the user's performance as against goals set by the user, a previous performance of the user, or the performance of other users. The response data is transmitted back to the user's PC and displayed. Thus, the user can participate in an exercise class simultaneously with other users who are all located at different sites.

WO 01/87426 A2

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

METHOD AND APPARATUS FOR MONITORING EXERCISE

BACKGROUND OF THE INVENTION

This invention relates to a method of and an apparatus for monitoring exercise.

Training or exercising at gyms is increasingly popular, and is generally considered preferable to solo training. Reasons for this include a social and competitive aspect which encourages participants to continue with an exercise program, as well as monitoring and guidance of participants by personal trainers or in an exercise class. Notwithstanding this, many individuals find it difficult to attend a gym regularly, and find solo exercise relatively less satisfactory, to the extent that they may abandon an exercise program.

It is an object of the invention to address this phenomenon.

CONFIRMATION COPY

SUMMARY OF THE INVENTION

According to the invention there is provided a method of monitoring exercise comprising:

monitoring, at a user site, at least one physical parameter of a user performing exercise and generating an output signal corresponding to said parameter;

generating performance data from the output signal;

transmitting the performance data to a remote site;

at the remote site, evaluating the performance data, generating response data and transmitting the response data to the user site; and

at the user site, displaying information derived from the response data to the user.

The user will typically be a person who wishes to participate in an exercise class, but who is unable to physically to be present at such a class.

Said at least one physical parameter of the user may be, for example, the user's heart rate, step cadence, skipping rate, push-up rate, running cadence, cycling speed and/or power, or other relevant physical parameters according to the type of exercise being performed.

The physical parameters may be sensed by one or more sensors, which preferably communicate wirelessly with a portable control unit worn by the user.

The performance data is preferably transmitted to a remote site via the Internet or another network, and may be evaluated at the remote site in comparison with similar performance data received from other users, or in comparison with stored performance data.

The response data may include comments or comparative data based on goals previously set by the user, a previous performance of the user, or the performance of other users, for example.

The user may participate in a virtual exercise class in which a plurality of users carry out exercise at a predetermined or scheduled time, in which case the response data may include comparative data derived from the performance data of each of the plurality of users.

The generation of the performance data and the transmission of the performance data to the remote site may take place in real time or near real time, that is, while the user is participating in the exercise class.

Alternatively, the performance data may be generated and recorded for later uploading to the remote site, for example, in the case of exercise carried out outdoors or at a location remote from the user's computer.

Further according to the invention there is provided apparatus for monitoring exercise comprising:

at least one sensor for monitoring a physical parameter of a user performing exercise and for generating an output signal corresponding to said parameter;

a first processor for generating performance data from the output signal;

an interface for transmitting the performance data to a remote site and for receiving response data from the remote site; and

a second processor for generating a display containing information derived at least partially from the response data.

The at least one sensor may be, for example, a heart rate sensor, a step sensor, a cycle speed and/or power sensor, or any other suitable sensor for monitoring a selected exercise parameter.

Conveniently, the first processor is housed in a portable control unit which is arranged to be worn by a user and which includes an input device operable by the user for controlling the operation thereof.

The control unit may include a first interface for receiving the output signal from the sensor or sensors.

The control unit may also include a second interface for transmitting the performance data to a computer of the user.

The first and second interfaces are preferably wireless.

The apparatus preferably includes software arranged to generate a display of information derived at least partially from the response data.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a pictorial view of the control unit of apparatus according to the invention for monitoring exercise;

Figure 2 is a highly simplified schematic block diagram of electronic circuitry of the control unit of Figure 1; and

Figures 3 and 4 are flow charts illustrating the method of the invention as applied to individual and class training sessions, respectively.

DESCRIPTION OF EMBODIMENTS

The present invention addresses problems experienced by individuals who wish to train or exercise but who are unable or unwilling to attend a class with other participants, or a training session. This is achieved by monitoring the individual's exercise performance, transmitting performance data to a central site for evaluation, and sending a response to the individual with feedback on his/her performance. Thus, an individual may exercise alone, for example in his or her home, but by utilising the method and apparatus of the invention, be connected effectively to a trainer or a class of similar individuals.

Referring to Figure 1, a user 10 is shown wearing a portable control unit 12 which can, for example, be clipped to the waistband of his or her shorts or tracksuit, or held in position by means of a strap around the waist. The control unit has a number of push buttons 14 and a display 16, typically a 240 by 120 pixel liquid crystal display (LCD).

The user 10 is also wearing a strap 18 which carries a heart rate monitor which transmits a short range RF output signal containing data corresponding to the user's heart rate.

Figure 2 shows the electronic circuitry of the control unit 12. The heart of the unit is a CPU 20, preferably an integrated low-current microprocessor such as the ARM processor. The CPU has associated memory 22 and controls the LCD display 16 and a beeper or sounder 24, and communicates via a short range RF interface module 26, for example utilising the new "Blue Tooth" technology.

The CPU 20 has a number of inputs to which are connected, inter alia, the input switches 14, a 5kHz receiver 28 for the heart rate monitor, a 125kHz receiver 30 for a cycle speed and power sensor, and a receiver 32 which receives an input from a step sensor. It will be appreciated that inputs and receivers or interfaces for various other types of sensor can be provided as required, according to the type of training or exercise being monitored. The control unit is powered by a battery 34.

The control unit 12 is used in convention with a conventional personal computer (PC) 36 of a user and an RF modem 38 which receives signals from the RF interface module 26, together with suitable software to allow the user to access a web site which is designed to provide an on-line training and/or group exercise class functionality, as described below.

In a first variation of the method of invention, an individual connects to the web site for an on-line custom designed personal training session run by a "Virtual Personal Trainer" (see Figure 3). The user connects to the web site, logs on and selects the option for a personal individual training program. If the user has previously registered, his or her details can be retrieved automatically, for example by using a user name and password, or the user may enter various identification information, including the participant's name, e-mail address, country and, optionally, a message or greeting. Further options include submitting his or her weight and a picture.

A Virtual Trainer display and voice are displayed, together with a program to be followed. In some cases, exercises can be performed near to the user's PC, while others, such as jogging, will be done remotely.

Although it is possible for the entire exercise program to be conducted while the user is on-line, it is preferred that the user download software to his or her PC which can run the exercise program on an offline basis, so that it is only necessary to download details of the chosen exercise class for any given session, allowing the PC to go off line.

The downloaded program will then explain the exercise routine to the user, issue timing and start/stop instructions, for example, and collect performance data from the user via the control unit 12. Where exercises are performed remotely from the PC, the relevant software and training session data are uploaded to the control unit 12, which displays relevant instructions to the user on the LCD 16.

From time to time, as the control unit 12 collects performance data from the user as he or she carries out the exercise program and transmits the data back to the PC, the downloaded program takes the PC online at intervals in order to upload the performance data to the web site. On the host computer of the web site, suitable software analyses the user's performance data and evaluates it in comparison with goals set by the user, the previous performance of the user for similar exercises, or the performance of other individuals, for example, and then transmits response data back to the user's PC which can be displayed in a graphic form.

At the end of each exercise, or at the end of the exercise session, the user is afforded an opportunity to enter comments or a difficulty assessment for uploading to the web site. A summary of the individual's performance can then

be transmitted back to the user's PC as a final stage in the exercise session before the user signs off.

In the above described individual training application of the invention, the user can be provided with a number of options in order to input varying goals and preferences, to tailor the training session to the user. It is also not necessary that the training session take place at a strictly scheduled time.

Referring now to the flow chart of Figure 4, a similar process is followed to log onto the web site. If the user has previously registered, his or her details can be retrieved automatically, for example by using a user name and password, or the user may enter various identification information, including the participant's name, e-mail address, country and, optionally, a message or greeting. Further options include submitting his or her weight and a picture. Since a class involving other participants is being joined, it will generally be necessary to select one of a number of scheduled classes in order for the user to participate in real time or near real time.

Again, instructions for carrying out the relevant exercise are displayed either on the PC or on the control unit 12, and performance data is collected from the user and displayed immediately on the PC or control unit, as well as being uploaded periodically to the web site for evaluation and comparison with the performance data of other participants in the class. Comparative performance data, comments and encouragement, and other information are then downloaded to each user's PC. A facility can be provided for individuals to make comments on the exercises and the class. At the end of the exercise class, a final comment is provided to users by the Virtual Trainer and participants are able to enter a final round of messages before signing off.

The host software running the system will operate a member database, containing all the details of each member including personal data, exercise and

program preferences, current training program, historical performance data, etcetera. The software will also maintain lists of current classes and will assign Virtual Trainers to classes and individual users. The software will also implement an exercise programs data base. The host software can be written in industry standard programming languages such as Pearl, C or Java as CGI scripts.

The PC used to access the web site can operate with a standard internet browser, such as Microsoft's Internet Explorer. Standard internet protocols are used for data transfer. The application software which is downloaded for execution on the PC will preferably be written in Java.

The main advantage of the above described method and apparatus is that it allows users who are physically isolated from other individuals to participate either in a supervised training session or a group training class, with monitoring of their performance and feedback, either on a personal basis or on a comparative basis with other participants. Depending on the demand, such classes can be scheduled frequently (eg. hourly or half-hourly) and at almost any time, given that it is not necessary for users to be in the same time zone as one another. By utilising a portable control unit, the user is not tied to his or her own PC, but can carry out exercises such as jogging remotely from the PC, with the display of relevant instructions and the collection of performance data being carried out by the portable control unit.

CLAIMS

1. A method of monitoring exercise comprising:

monitoring, at a user site, at least one physical parameter of a user performing exercise and generating an output signal corresponding to said parameter;

generating performance data from the output signal;

transmitting the performance data to a remote site;

at the remote site, evaluating the performance data, generating response data and transmitting the response data to the user site; and

at the user site, displaying information derived from the response data to the user.

2. A method according to claim 1 wherein said at least one physical parameter of the user is the user's heart rate, step cadence, skipping rate, push-up rate, running cadence, cycling speed and/or power, or another physical parameter relevant to the type of exercise being performed.

3. A method according to claim 1 or claim 2 wherein the physical parameters are sensed by one or more sensors which communicate wirelessly with a portable control unit worn by the user.

4. A method according to any one of claims 1 to 3 wherein the performance data is transmitted to the remote site via the Internet or another network.

5. A method according to any one of claims 1 to 4 wherein the performance data is evaluated at the remote site in comparison with similar performance data received from other users.

6. A method according to any one of claims 1 to 5 wherein the performance data is evaluated at the remote site in comparison with stored performance data.

7. A method according to any one of claims 1 to 6 wherein the response data includes comments or comparative data based on goals previously set by the user, a previous performance of the user, or the performance of other users.

8. A method according to any one of claims 1 to 7 wherein the user participates in a virtual exercise class in which a plurality of users carry out exercise at a predetermined or scheduled time, the response data including comparative data derived from the performance data of each of the plurality of users.

9. A method according to claim 8 wherein the generation of the performance data and the transmission of the performance data to the remote site take place in real time or near real time, while the user is participating in the virtual exercise class.

10. A method according to any one of claims 1 to 9 wherein the performance data is generated and recorded for later uploading to the remote site.

11. A method according to claim 10 wherein the performance data is generated at an exercise location outdoors or at a location remote from the user's computer.

12. Apparatus for monitoring exercise comprising:

at least one sensor for monitoring a physical parameter of a user performing exercise and for generating an output signal corresponding to said parameter;

a first processor for generating performance data from the output signal;

an interface for transmitting the performance data to a remote site and for receiving response data from the remote site; and

a second processor for generating a display containing information derived at least partially from the response data.

13. Apparatus according to claim 12 wherein the at least one sensor is a heart rate sensor, a step sensor, a cycle speed and/or power sensor, or another suitable sensor for monitoring a selected exercise parameter.

14. Apparatus according to claim 12 or claim 13 wherein the first processor is housed in a portable control unit which is arranged to be worn by a user and which includes an input device operable by the user for controlling the operation thereof.

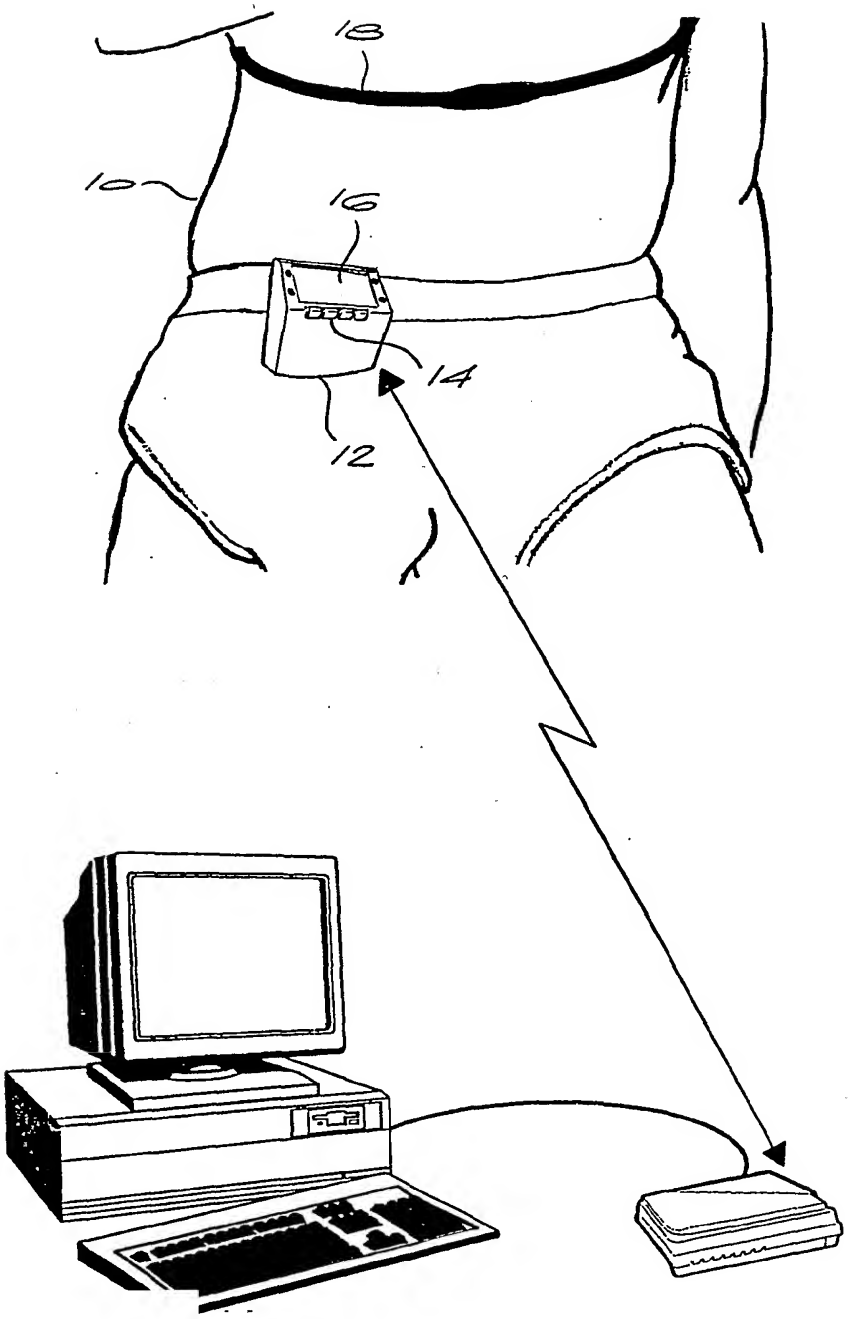
15. Apparatus according to any one of claims 12 to 14 wherein the control unit includes a first interface for receiving the output signal from the sensor or sensors.

16. Apparatus according to claim 15 wherein the control unit includes a second interface for transmitting the performance data to a computer of the user.

17. Apparatus according to claim 16 wherein the first and second interfaces are wireless.

18. Apparatus according to any one of claims 12 to 17 wherein the apparatus includes software arranged to generate a display of information derived at least partially from the response data.

FIG 1



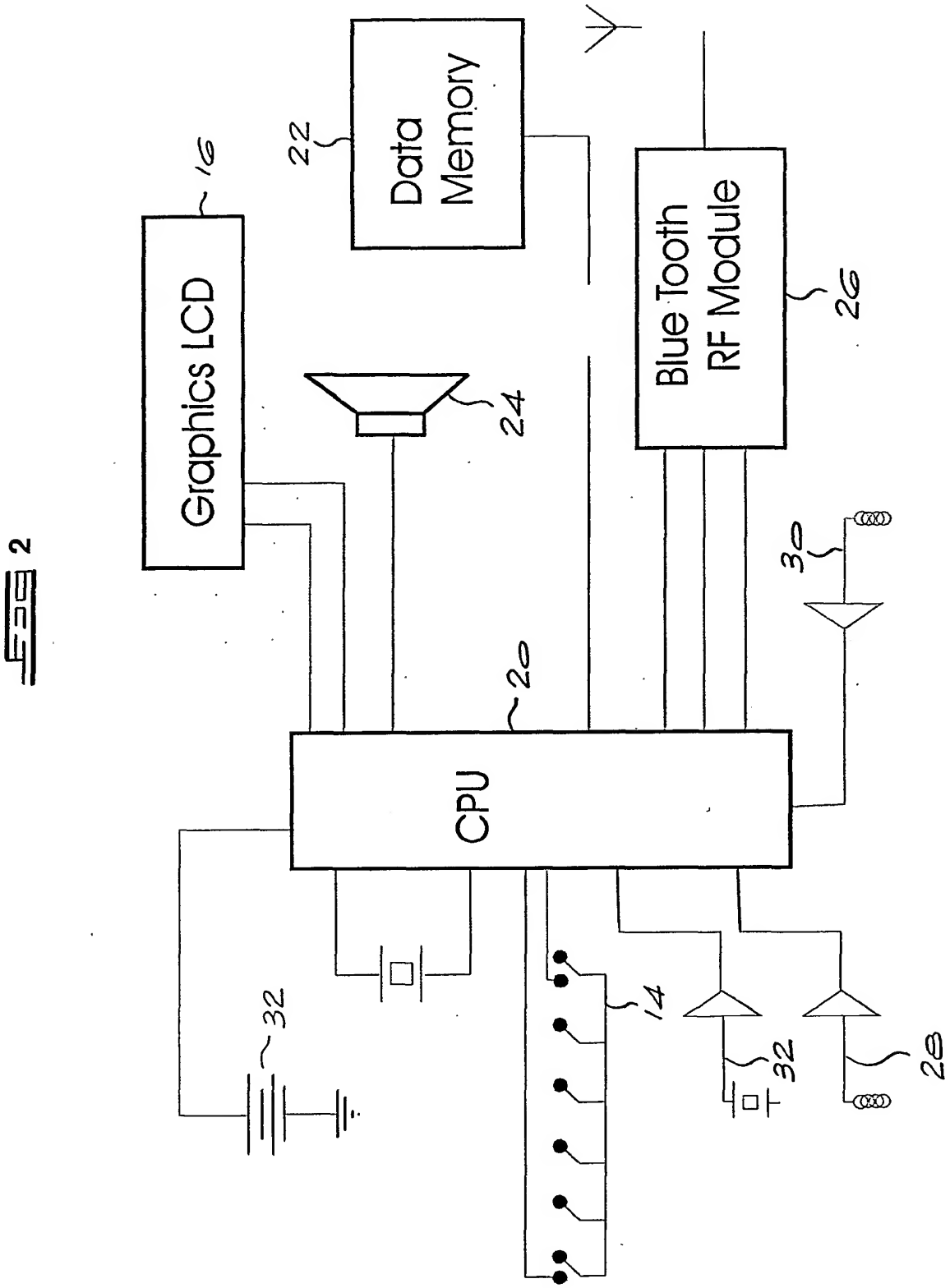

Graphics LCD
16
Data Memory
22
Blue Tooth RF Module
26
24
30
CPU
20
32
14
32
28

FIG 2

Fig 3

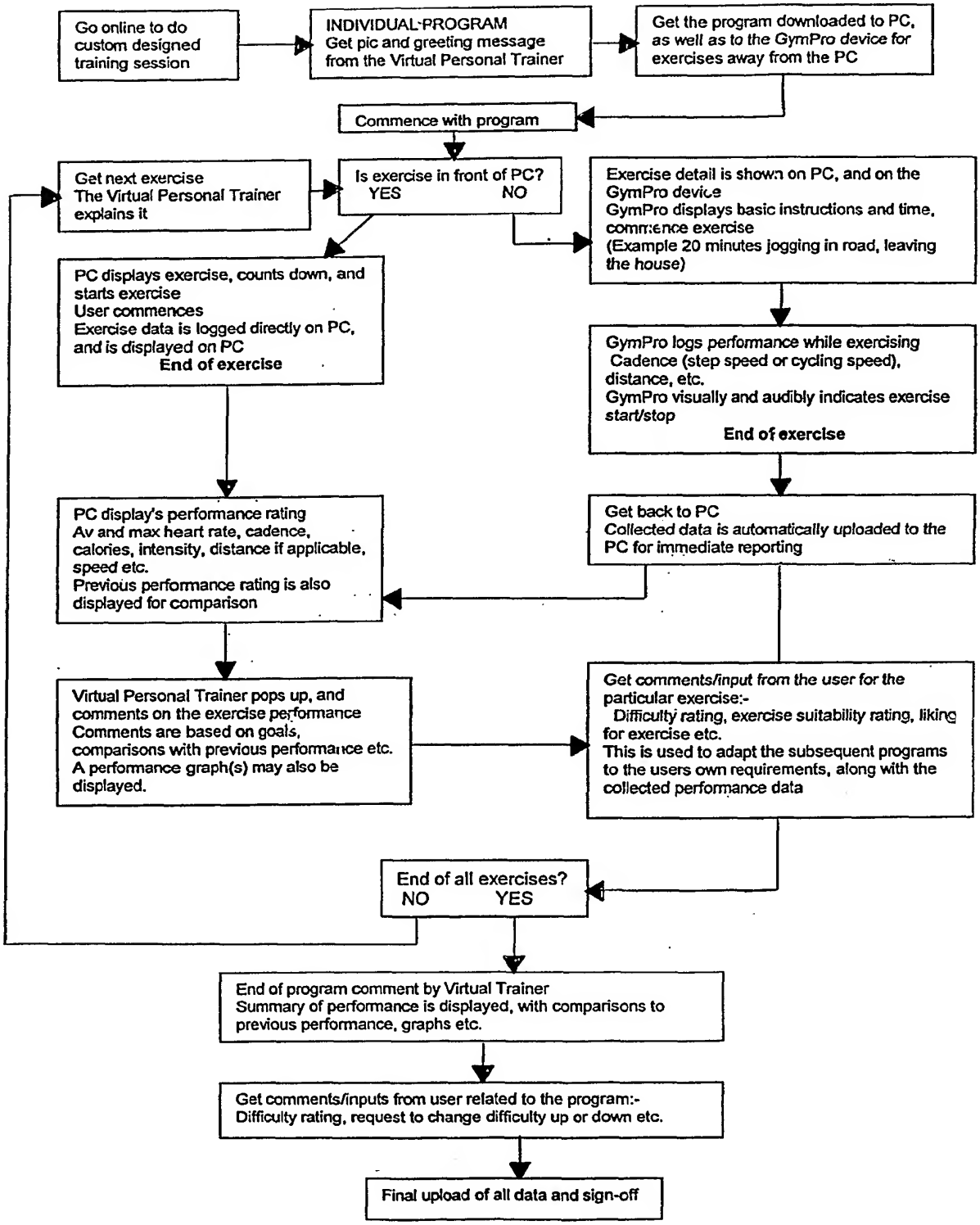
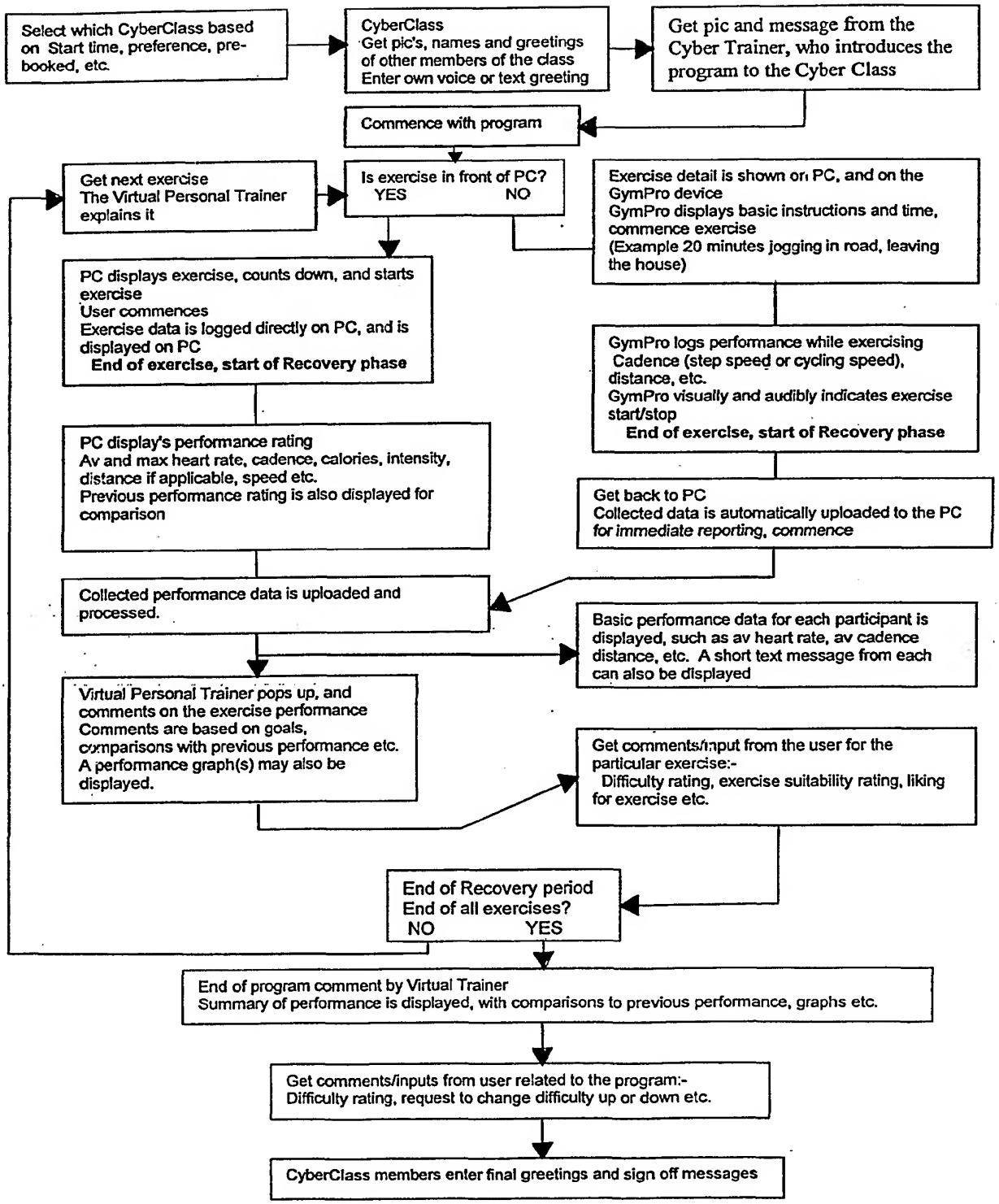

Go online to do custom designed training session
INDIVIDUAL PROGRAM
Get pic and greeting message from the Virtual Personal Trainer
Get the program downloaded to PC, as well as to the GymPro device for exercises away from the PC
Commence with program
Get next exercise
The Virtual Personal Trainer explains it
Is exercise in front of PC?
YES NO
Exercise detail is shown on PC, and on the GymPro device
GymPro displays basic instructions and time, commence exercise
(Example 20 minutes jogging in road, leaving the house)
PC displays exercise, counts down, and starts exercise
User commences
Exercise data is logged directly on PC, and is displayed on PC
End of exercise
GymPro logs performance while exercising
Cadence (step speed or cycling speed), distance, etc.
GymPro visually and audibly indicates exercise start/stop
End of exercise
PC display's performance rating
Av and max heart rate, cadence, calories, intensity, distance if applicable, speed etc.
Previous performance rating is also displayed for comparison
Get back to PC
Collected data is automatically uploaded to the PC for immediate reporting
Virtual Personal Trainer pops up, and comments on the exercise performance
Comments are based on goals, comparisons with previous performance etc.
A performance graph(s) may also be displayed.
Get comments/input from the user for the particular exercise:-
Difficulty rating, exercise suitability rating, liking for exercise etc.
This is used to adapt the subsequent programs to the users own requirements, along with the collected performance data
End of all exercises?
NO YES
End of program comment by Virtual Trainer
Summary of performance is displayed, with comparisons to previous performance, graphs etc.
Get comments/inputs from user related to the program:-
Difficulty rating, request to change difficulty up or down etc.
Final upload of all data and sign-off

Fig 4


Select which CyberClass based on Start time, preference, pre-booked, etc.
CyberClass
Get pic's, names and greetings of other members of the class
Enter own voice or text greeting
Get pic and message from the Cyber Trainer, who introduces the program to the Cyber Class
Commence with program
Get next exercise
The Virtual Personal Trainer explains it
Is exercise in front of PC?
YES NO
Exercise detail is shown on PC, and on the GymPro device
GymPro displays basic instructions and time, commence exercise
(Example 20 minutes jogging in road, leaving the house)
PC displays exercise, counts down, and starts exercise
User commences
Exercise data is logged directly on PC, and is displayed on PC
End of exercise, start of Recovery phase
GymPro logs performance while exercising
Cadence (step speed or cycling speed), distance, etc.
GymPro visually and audibly indicates exercise start/stop
End of exercise, start of Recovery phase
PC display's performance rating
Av and max heart rate, cadence, calories, intensity, distance if applicable, speed etc.
Previous performance rating is also displayed for comparison
Get back to PC
Collected data is automatically uploaded to the PC
for immediate reporting, commence
Collected performance data is uploaded and processed.
Basic performance data for each participant is displayed, such as av heart rate, av cadence distance, etc. A short text message from each can also be displayed
Virtual Personal Trainer pops up, and comments on the exercise performance
Comments are based on goals, comparisons with previous performance etc.
A performance graph(s) may also be displayed.
Get comments/input from the user for the particular exercise:-
Difficulty rating, exercise suitability rating, liking for exercise etc.
End of Recovery period
End of all exercises?
NO YES
End of program comment by Virtual Trainer
Summary of performance is displayed, with comparisons to previous performance, graphs etc.
Get comments/inputs from user related to the program:-
Difficulty rating, request to change difficulty up or down etc.
CyberClass members enter final greetings and sign off messages

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Declarations under Rule 4.17:
— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

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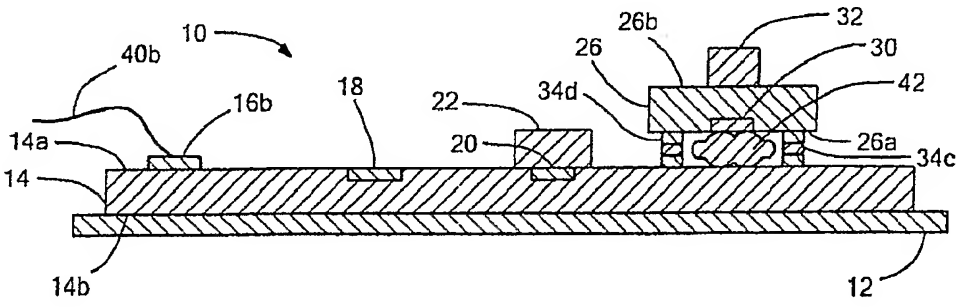

(57) Abstract: An integrated circuit (10) can have a first substrate (14) supporting a magnetic field sensing element (30) and a second substrate (26) supporting another magnetic field sensing element (20). The first and second substrates can be arranged in a variety of configurations. Another integrated circuit can have a first magnetic field sensing element and second different magnetic field sensing element disposed on surfaces thereof.

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INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. G01R15/20 G01R33/02 G01R33/06 G01R33/07 G01R33/09
H01L43/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G01R H01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, COMPENDEX, INSPEC, IBM-TDB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 426 620 B1 (TAGUCHI MOTOHISA [JP] ET AL) 30 July 2002 (2002-07-30)	1-19
A	the whole document	20-60
X	US 5 686 879 A (SCHUHL ALAIN [FR] ET AL) 11 November 1997 (1997-11-11)	51-54
A	the whole document	1-50, 55-60
X	EP 1 225 453 A (DELPHI TECH INC [US]) 24 July 2002 (2002-07-24)	46-50, 55-60
A	the whole document	1-45, 51-54
A	US 2003/151406 A1 (WAN HONG [US] ET AL) 14 August 2003 (2003-08-14) abstract	1-60

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[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
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Date of the actual completion of the international search	Date of mailing of the international search report
30 January 2008	05/02/2008

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Dogueri, Kerem

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